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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/529,152

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EXAMINER

OLSEN, ALLAN W

ART UNIT

PAPER NUMBER

1792

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/529,152	<b>Applicant(s)</b> KIMURA, YASUKI	
	<b>Examiner</b> Allan Olsen	<b>Art Unit</b> 1792	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 25 August 2006.
- 2a) ☒ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 21-25, 27-36 and 38-45 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21-25, 27-36 and 38-45 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 21 May 2007 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892)                                   | 4) <input type="checkbox"/> Interview Summary (PTO-413)                     |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)               | Paper No(s)/Mail Date. _____  |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>6/16/08</u> .   | 6) <input type="checkbox"/> Other: _____                                    |

## **DETAILED ACTION**

### ***Response to Amendment***

The declaration under 37 CFR 1.132 filed June 16, 2008 is insufficient to overcome the rejections based upon Kwon as set forth in the last Office action because: the evidence therein and the accompanying arguments are not commensurate with the scope of the claim language.

The recitation in claim 21 pertaining to plasma density is contained within a wherein clause and therefore does not limit the claim (see MPEP 2106). This could be overcome by using a positive recitation, for example, "setting the power to a level such that...".

The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Claim Rejections - 35 USC § 102***

**Claims 21, 22, 31, 32, 36, 38-40, 42 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Kwon et al. in Loading Effect Parameters at Dry Etcher System and Their Analysis at Mask-to-Mask Loading and Within-Mask Loading, SPIE Vol. 4562 pp. 79-87 (hereinafter, Kwon).**

Kwon teaches etching a Cr-based, thin-film photomask. Kwon teaches using an ICP and an etchant comprising Cl<sub>2</sub>, O<sub>2</sub> and He (page 81, line 2). Kwon teaches etching Cr, in the presence of a polymeric organic photoresist (page 80, last line). Kwon teaches etching over a wide range of photoresist/chromium loadings that encompass

photoresist coverages that are above and below 70% of the Cr film (see figures 1 and 5). Kwon teaches a Cr: photoresist etch selectivity of less than 1.5 (see figure 3). Kwon teaches etching Cr while using parameters such as the power of the plasma source, flow rates and pressure, that match those used by applicant. As such, Kwon is considered to etch at a power level below that which causes a jump in plasma density. Furthermore, Kwon teaches applying a bias power thereby causing at least a part of the chemical species to be supplied in the direction perpendicular to the thin film. Regarding the limitation in claims 21, 31 and 43 that requires etching the thin film in presence of an organic substance other than that derived from the resist layer, the examiner notes that the resist layer itself satisfies this limitation as it is not an organic substance that is *derived* from the resist layer. Figure 1 of Kwon shows the formation of a mask pattern with a design size of 0.8  $\mu\text{m}$  and figure 6 shows CD deviation of 15nm or less.

**Claims 21,23, 31, 39 and 43 are rejected under 35 U.S.C. 102(b) as being anticipated by Stoer et al. in WO 01/96955 (hereinafter, Stoer).**

Stoer teaches etching a Cr-based, thin-film photomask. Stoer teaches using an ICP and an etchant comprising  $\text{Cl}_2$ ,  $\text{O}_2$  and He (page 18). Stoer teaches etching Cr, in the presence of a polymeric organic photoresist (page 17). Stoer teaches a Cr: photoresist etch selectivity of less than 1.5 (see figure 3). Stoer teaches using low plasma excitation power. Stoer teaching using 700 W of power or less (see page 5). As such Stoer teaches a power range that includes the minimum power required to produce a plasma and therefore is considered to etch at a power level below that which

causes a jump in plasma density. Furthermore, Stoer teaches applying a bias power thereby causing at least a part of the chemical species to be supplied in the direction perpendicular to the thin film. Stoer teaches the etching gas comprises an organic component that forms passivating deposits on the sidewalls of the resist (see page 8). Figure 1 of Kwon shows the formation of a mask pattern with a design size of 0.8  $\mu\text{m}$  and figure 6 shows CD deviation of 15nm or less.

***Claim Rejections - 35 USC § 103***

**Claims 23-25, 27, 28, 30, 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwon, as applied above to claims 28 and 39, in view of Oh et al. in Proc. SPIE Vol. 4186, pp. 532-539, Dry Etching Technology of Cr and MoSi Layers Using High-Density Plasma Source (hereinafter, Oh).**

Kwon does not teach biasing the substrate by applying a high frequency power.

Oh teaches additional details regarding the apparatus that is used by Kwon (see line 1 on page 81 of Kwon and Kwon's reference 5). Oh teaches that the DC bias that is disclosed by Kwon is controlled by the power level of an RF bias (page 537, last sentence before figure 6). Oh teaches applying 10-15 W of RF bias power while applying 150-200 W of plasma excitation power.

It would have been obvious to one skilled in the art to control the DC bias taught by Kwon by using applying a high frequency power to the substrate because Kwon discloses using the apparatus used by Oh and Oh teaches controlling the DC bias with a high frequency power source. The application of a high frequency bias power would cause the chemical species to be supplied in a direction perpendicular to the thin film.

**Claim 29 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kwon in view of Oh, as applied above to claims 28, in view of US Patent 4,613,401**

**issued to Hoshino and further in view of US Patent 6,913,706 issued to Yan et al. (hereinafter, Yan).**

The combination of Kwon and Oh does not teach adding an organic gas to the etchant.

Hoshino teaches adding ethanol vapor to a plasma etching gas when etching Cr. See, for example, abstract and column 4, lines 28+.

Yan teaches that chromium-oxychloride is produced when Cr is plasma etched with  $\text{Cl}_2$  and  $\text{O}_2$  (column 2, lines 22-24).

It would have been obvious to one skilled in the art to add ethanol to the etchant of Kwon because Hoshino teaches that the addition of ethanol greatly enhances the removal of chromium-oxy-chloride reaction products and Yan teaches that chromium-oxy-chloride would be produced by Kwon's use of  $\text{Cl}_2$  and  $\text{O}_2$  to plasma etch Cr.

**Claims 33-35 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kwon, as applied above to claim 32, in view of US Patent 4,613,401 issued to Hoshino and further in view of Yan.**

Kwon does not teach adding an organic gas to the etchant.

Hoshino teaches adding ethanol vapor to a plasma etching gas when etching Cr. See, for example, abstract and column 4, lines 28+.

Yan teaches that chromium-oxychloride is produced when Cr is plasma etched with  $\text{Cl}_2$  and  $\text{O}_2$  (column 2, lines 22-24).

It would have been obvious to one skilled in the art to add ethanol to the etchant of Kwon because Hoshino teaches that the addition of ethanol greatly enhances the

removal of chromium-oxy-chloride reaction products and Yan teaches that chromium-oxy-chloride would be produced by Kwon's use of  $\text{Cl}_2$  and  $\text{O}_2$  to plasma etch Cr.

**Claim 41 is rejected under 35 U.S.C. 103(a) as being unpatentable over Kwon, as applied above to claim 40, in view of US Patent 6,989,603 issued to Zhang.**

Kwan does not teach a mask comprising an optical proximity correction pattern.

Zhang teaches masks comprising an optical proximity correction pattern.

It would have been obvious to one skilled in the art to fabricate a mask comprising an optical proximity correction pattern because Zhang teaches that such masks well known as being highly precise (column 2, line 33).

### ***Conclusion***

Applicant's submission of an information disclosure statement under 37 CFR 1.97(c) with the fee set forth in 37 CFR 1.17(p) on June 16, 2008 prompted the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 609.04(b). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any

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extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Allan Olsen whose telephone number is 571-272-1441. The examiner can normally be reached on M, W and F: 1-5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on 571-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

/Allan Olsen/  
Primary Examiner, Art Unit 1792